Who Did the Owl Eat?

Overview: Students learn that owls have specific adaptations that enable them to be superb hunters. Through the dissection of owl pellets, students will understand a simple food chain, by observing what animals the owls have eaten, and about the skeletal bones of the prey

Content Standards Correlations: Science, p. 309

Grades: K-6

Key Concepts:. Owl adaptations include: superb hearing and eyesight, wings that allow for silent flight, and strong, sharp talons. By studying what an owl has eaten, we can learn more about the habitat that the owl hunts in.

Objectives: Students will be able to:
•name four adaptations owls have that enable them to be successful hunters.
•identify rodent and/or bird bones
•name one thing they can learn about the salt marsh habitat by studying owl pellets

Materials:
Provided by the Refuge
• 1 set of visuals describing beaks and feet adaptations
•12 quartered petri dishes
•12 tweezers
•12 hand lenses
•12 bone identification chart placemats
•3 posters: *Food Web, Vole Skeleton, Bone Identification*
•taxidermy owl parts: head, wing, feet
•1 pellet display
•1 bone display
•owl call player
Provided by the educator
•owl pellets (1 for every 2 students)
•plastic bags to take home bones (1 for each student) - *optional*

*** Preparing for the Activity - *Before the Field Trip***
Find a source and order your owl pellets at least 3 weeks prior to your field trip.

Time Frame for Conducting this Activity

Recommended Time: 30 minutes
Introduction (2 minutes)
• present information about owls
Owl Adaptations (9 minutes)
• give background information on owls
• describe the adaptations of owls
Dissecting Owl Pellets (15 minutes)
• pass out pellets
• students extract the bones
• students try to identify the bones
Discussion (2 minutes)
• discuss the food web and maintaining balance in an ecosystem
• discuss how to protect owls and their habitats
Clean-Up (2 minutes)
• clean up table space
• students wash their hands

How this Activity Relates to the Refuge's Resources

What are the Refuge's resources?
• significant wildlife habitat
• endangered species
• migratory birds
What makes it necessary to manage the resources?
• Loss of salt marsh habitat due to landfill and development.
What can students do to help?
Refuge staff work with other environmental organizations to buy and protect salt marsh habitat but we need your help.
• Never put anything down a storm drain. The water flows to the Bay and then the tides bring the water into the salt marsh habitats.
• Teach others what you have learned about the importance of the salt marsh to owls and people.

Supporting Information For Conducting This Activity

General Information

- Owls are found all over the world. The barn owl has 17 subspecies located throughout the world.
- Owls range in size from 4 ½ inches (least pygmy) to 2 ½ feet (great grey).
- The marshes around the Don Edwards San Francisco Bay National Wildlife Refuge provide food for a variety of owl species. The salt marsh supports five mouse-sized animals including: meadow mouse or vole (*Microtus califonicus*), house mouse (*Mus musculus*), white-footed deer mouse (*Peromyscus maniculatus*), salt marsh harvest mouse (*Reithrodontomys raviventris*), and the wandering shrew (*Sorex vagrans*). The red-winged blackbird (*Agelaius phoeniceus*)is another important prey item that is commonly eaten by owls.
- Owls help keep the rodent population in check.
- Pellets (the undigested portion of a bird's meal) are often associated with birds of prey. However, 330 species from more than 60 birds families produce pellets. These families include robins, starling, king fishers, tree swallows, owls, hawks and eagles.

Adaptations that make owls superb night hunters

- An adaptation is a change in a living thing that enables it to survive.

Ears

- Owls have very unique adaptations that make them superb night hunters. Their facial disks aid hearing, i.e. the round area of feathers on the face directs sound to the ears. (Try cupping your hands around your ears. It's the same idea!)
- A Barn Owl can hear a mouse chewing grass seeds or moving around 40 feet away.
- One ear is higher on the head than the other so that the owl can move their head around too find the exact location of their prey.

Eyes

- Since an owl's eyes are found on the front of the head (like people) they have binocular vision.
- Owls eyes are large in order to allow a lot of light to enter. Their eyes are so big that they have no room to move up, down or sideways. The owl must keep turning its head to follow a moving object. Owls have 14 bones in their neck so they can turn their neck 180 degrees each direction. (An owl can turn its neck so far and so fast, it sometimes looks as though the head is spinning 360 degrees!)

Wings and Feet

- The feathers on the owl's wing have soft edges that make their flight silent, which is another sign of a good hunter.
- Once the owl has located its prey, it swoops down and grabs it with its very sharp "claws" or talons. Owls have four talons at the ends of their feathered legs: Two face forward and one faces backward, while the one the outside can face forward or backward, so they can have opposing pairs of talons.Once an animal is in the owl's grasp, it rarely escapes.

The making of an owl pellet

- For an owl, one meal may include a mouse and a bird, or two to three rodents.
- Owls swallow their prey head first.
- Digestion requires 12 to 22 hours.
- The prey goes into the first stomach, a wide place in the esophagus, where digestion is started. Later it moves down into a second stomach, called the "gizzard". All of the meat is digested and passed through a tiny opening in the gut. The non-digestible items left in the second stomach are formed into a compact clump of bones and fur or feathers (shaped somewhat like egg) which is regurgitated by the owl. This is an owl pellet.
- Indigestible animal parts found in pellets include: mammal bones, beaks, claws and bones of birds; bones of reptile and amphibians; hard portions of insects; and seed husks or other coarse vegetable materials from the stomachs of the prey.

Identification of Some Common Mammals

Order Rodentia consists of small to medium sized mammals, including squirrels, marmots, mice, and rats. These mammals have 2 incisors above and below. Below is a list of mice and rats included in the order *Rodentia* that may be found in the owl pellets.

Meadow mouse: A cleaned skull will show a row of wavy teeth. Pull a molar and note that there are no roots, just a squared off bottom end where it sits in the jaw bone.

White-footed deer mouse: Using a cleaned skull, note the opening in the palate. The rear end of the opening goes up to the palate. The rear end of the opening goes up to the end of the row of premolars, but not between the premolars (see house mouse below). Use tweezers to pull a molar and note that there are roots, much like our own teeth.

House mouse: Using a cleaned skull, note that the opening in the palate goes back between the first premolars, unlike the deer mouse (above). Pull a molar and note the roots on the tooth.

Salt marsh harvest mouse: You may never see one of these (they hide very well and are not easily captured by owls; in addition they are not found in owl pellets from geographic areas outside of the San Francisco Bay), but if you do, remember that the upper incisors (front teeth) are orange and have a vertical groove in each tooth.

Roof rat: These are larger than any of the rodents listed above. The teeth have roots, but not on the mount of sample skulls. Note that the parietal bone in the rear part of the skull is shaped differently in the roof rat and the Norwegian rat. Holding the skull facing away from you, note that the parietal of the roof rat is wider and more narrow, like the roof of a house. Whereas, the parietal of the Norwegian rat is higher in relation to width.

Norwegian rat: See above. A parietal bone is wider than that of the roof rat. This rat also has roots on the molars.

Gopher: The skull is much larger than that of the rat or mouse, with sturdy molars that have no roots.

Order Insectivora are small mammals that eat insects. These include shrews, moles, and bats.

Wandering shrew: The pointed shape of the nose gives this shrew away. The shrew is a carnivore, so the teeth look like those of a dog or a cat. Most shrews will be smaller than the house or deer mouse.

How to Lead this Activity by Following the "Do, Read, Ask" Teaching Format

Introduction (2 minutes)
Read

- "Welcome to 'Who Did the Owl Eat?' Please take your seats and place your hands in your laps. You will not need any of the equipment in front of you until later. Thank you.
- "Today, we are going to be learning about owls and dissecting owl pellets. Owls are found all around the world. They can be as tiny as the least pygmy owl that is only 4 ½ inches long, or as large as the great grey owl that is 2 ½ feet long.
- "There are a few different types of owls found throughout the San Francisco Bay including, burrowing owls, short eared owls, great horned owls, and barn owls."

Owls and Their Adaptations (9 minutes)
Read
"Did you know that there are over 133 different species of owls?"

Do
Hold up pictures **1**, **2**, and **3** of the different owls. (The pictures have numbers on the back.) Read off the names of different owls.

Read

- "Great gray owl (1), snowy owl (2), and the burrowing owl (3).
- "Today we are going to learn how the owls get their prey and what they eat.
- "Even though each owl is different, they all have similar adaptations to help them survive.
- "All owls are predators and nocturnal."

Ask
? Who can tell me what predator means?
(It is an animal that lives by killing and eating other animals for food.)

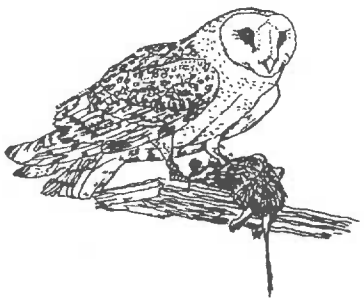
Ask
? Who can tell me what nocturnal means?
(It means that they are active during the night.)

Ask
? Does anyone know what adaptation

means? (A change in a living thing that helps it survive.)
? What types of adaptations would an owl need to be able hunt at night? (Take many answers improved hearing, eyesight etc.)

Read
"Owls have very unique adaptations that make them superb night hunters. This is a barn owl."

Do
Hold up picture of the barn owl (**4**) while you are talking.



Read
"If you come to the refuge in the evening you may be able to see one flying around. But if you get too close, the barn owl may hiss or scream at you. Unlike some owls, the barn owl doesn't make a hooting sound."

Do
Play the barn owl call using the bird call player.

1st Adaptation Hearing
Read
- "Barn owls have the adaptation of very good ears for locating prey. Theirs hearing is so good that they can hear a mouse chewing from 4 feet away.
- The owl's facial disks aid hearing. Notice the round area of feathers on the face. This arrangement of feathers directs sound to the ears.
- Try cupping your hands around your ears-it's the same idea!"

Do
Hold up the visual with the birds ears (**5**), and point to the diagram.

Read
"The ear opening is covered by feathers on the sides of the head behind the eyes. The left ear of the barn owl is higher than the right. This allows the owl to find the exact location of its prey."

2nd Adaptation: Big Eyes
Read
- "Special feathers around each eye form shallow funnels called 'facial disks'. These funnels direct light into the eyes of the owl to see in almost total darkness.
- "Since the owl's eyes are found on the front of the head (like people) they have what is called binocular vision. Binocular vision allows owls, and us, to judge distance.
- "Owl's eyes are large in order to allow a lot of light to enter. Their eyes are so big that they have no room to move up or down, or sideways.
- "The owl must keep turning its head to follow a moving object. Owls have 14 bones in their neck so they can turn their neck 180 degrees each direction.
- "An owl can turn its neck so far and so fast it sometimes looks as though the head is spinning 360 degrees!"

Do
Hold up diagram of the owl eyes (**6**).

3rd Adaptation: Silent Wings
Read
"The owl is very careful to make sure the mouse can't hear him. Its wings have very soft feathers, so the mouse doesn't know it is about to be caught."

Do
Pick up the wing (**7**).

Read
"The feathers on the owl's wing have soft edges that make their flight silent. This is another sign of a good hunter. Close your eyes and listen as I 'flap' the wing. [FLAP WING] Open your eyes."

Ask
? What did you hear? (Hopefully, nothing!)

Read
"The owl's feathers are soft and fringed compared to the feathers of other birds."

Do
Show the diagram with feathers on it (**8**).

4th Adaptation: Sharp Talons
Do
Pick up talons (**9**).

Read
- "Once the owl has located its prey, it swoops down and grabs it with its very hard 'claws' called talons.
- "Owls have four talons at the ends of their feathered legs; two face forward and one backward.
- " The sharp talons help the owl to kill the mouse instantly. Once the animal is in the owl's grasp, it rarely escapes."

Do
Pass around the talons.

5th Adaptation: Sharp Beak
Do
Show the beak visual (**10**).

Read
"Look at the sharp beak of the pygmy owl. If the prey is still moving after it has been caught, the owl uses its beak to crush the skull."

Do
Show the picture of the owl with the mouse in its mouth (**11**).

Read
"After all, it doesn't want a live mouse running around in its stomach. It also uses its beak to transport prey and tear meat apart to give to its baby owlets."

Owl Pellets (13 minutes)
Ask
? What do owls eat? (small mammals and occasionally small birds)
? What is an owl pellet? (Undigested remains of what an owl ate. The owl cannot digest the bones, fur, and feathers of its prey, so the owl collects these items in its stomach and clumps them up into an egg shaped owl pellet, which is then regurgitated or spit up.)

Read
"Scientists dissect owl pellets to look at the different bones, fur, or feathers that are inside."

Ask
? As scientists, what can we learn from owl pellets? (A scientist may want to study owl pellets to learn how owls fit into the food web; to find what animals live in the owl's habitat; and to learn about the skeletal bones of the prey.)
? What types of animals does the owl eat here at the refuge? (salt marsh harvest mice and red-winged blackbirds.)

Do

Show the picture of the salt marsh harvest mouse(**12**).

Read

"This is the salt marsh harvest mouse. He/ she is very good at hiding from owls beneath the pickleweed, so you probably will not see the mouse in the marsh."

Do

Show the picture of the red-winged blackbirds(**13**).

Read

- "Feathers and bones from birds, such as the red-winged blackbird, do appear in the pellets. Some owls eat insects, like the burrowing owl.
- "The burrowing owl lives on the ground. Much of its food supply consists of insects.
- "In the pellets you dissect today, you are likely to find the skulls of the California meadow mouse.
- "You may also find the skulls of rats. The skulls of mice and rats are similar, except that they may be different sizes."

Do

Point to the rats and mice on the skeleton poster, to give the kids an idea of what they are looking for.

Read

- "You might find bones from a shrew, a rodent like animal about the size of a mouse that eats insects and other small animals. The shrew's skull is different from a mouse skull, because it has sharp teeth in the front, like a dog or a cat, which it uses to rip apart prey."

Do

Point to the shrew on the poster.

Read

- "Finally you might find bones of a bird skeleton. Notice that the bird has no teeth.
- "Now we are going to become scientists to find out what species of animals these owls have eaten."

Do

- Have the students dissect owl pellets. As they dissect the pellets they can identify what types of bones they have found by using the bone sorting chart on their placemats, or by using the bone display or posters.
- At the end of the session students can put their bones in a plastic bag (provided by educator) to take home with them.